REMARKS

Claims 1-7, and 9-23 are pending in the application. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

1. REJECTION UNDER 35 U.S.C. § 102

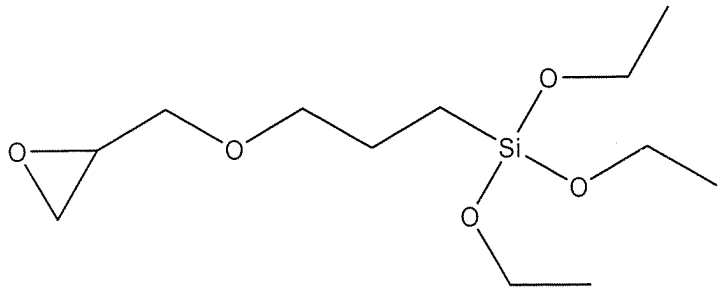
Claims 1 and 3-20 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Kambe et al. (U.S. Pat. No. 6,599,631). This rejection is respectfully traversed.

The present invention as embodied in independent claim 1 is drawn to an aqueous dispersion with a pH from 2 to 7 that includes at least four separate components. The components include a swellable polymer/oligomer; modified inorganic nanoparticles; an amphiphile or a compound that can form a chelate ligand; and a crosslinking agent. The Kambe reference cannot anticipate the present claims as the reference is missing several of these claimed features. See *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987) (Each and every element as set forth in the claim must be present in the reference for the claim to be anticipated.). Specifically, Kambe does not disclose inorganic nanoparticles modified with a compound of formula I, i.e., $[(S\text{-})_o\text{-}L\text{-}]_mM(R)_n(H)_p$, and Kambe also fails to disclose modified nanoparticles dispersed with a separate crosslinker. In view of these shortcomings the present claims are novel over Kambe.

1.1 Kambe does not disclose nanoparticles modified with a compound of the formula $[(S\text{-})_o\text{-}L\text{-}]_mM(R)_n(H)_p$.

The present claims include surface-modified, cationically stabilized, inorganic nanoparticles modified with at least one compound of the general formula I: $[(S\text{-})_o\text{-}L\text{-}]_mM(R)_n(H)_p$; where S is a reactive functional group; L is an at least divalent organic linking group; H is a hydrolyzable monovalent group or a hydrolyzable atom; M is a divalent to hexavalent main group or transition group metal; R is a monovalent organic radical; o is an integer from 1 to 5; m+n+p is an integer from 2 to 6; p is an integer from 1 to 6; and m and n are zero or an integer from 1 to 5. Paragraphs [0071] to [0117].

An example of surface modification of nanoparticles using a compound of formula I can be found in Preparation Example 2, paragraphs [0167]-[0169] of the present disclosure. In this example, a compound of formula I, glycidyloxypropyltriethoxysilane (see following 2D structure), is reacted with the inorganic nanoparticles of a boehmite sol (aluminium oxide hydroxide (AlO(OH)) mineral), where an ethoxy group from the silicon atom leaves as ethanol following hydrolysis. Thus, the claimed dispersion include the nanoparticles in the presently claimed dispersion that have their



surface already modified, and in addition, a separate crosslinking agent.

In contrast, the Kambe reference does not teach a dispersion having surface modified nanoparticles. Instead, the Kambe reference describes a composite formed of a polymer either chemically bonded directly to inorganic nanoparticles or bonded via a linker compound. Kambe abstract; col. 1, lines 57-59; col. 4, lines 58-62. The inorganic nanoparticles include metal or metalloid elements in their elemental form or in compounds. Kambe col. 6, lines 9-27. The reference does not describe any surface modifications for these nanoparticles, much less surface-modification with compounds of formula I. As such, Kambe does not disclose a dispersion that includes surface-modified nanoparticles

Kambe does describe formation and use of a dispersion in generating the composite. The dispersion is used to form the polymer-inorganic particle composites, which are subsequently molded, extruded, cast, or otherwise processed using polymer processing technology to form various shapes of materials. Kambe col. 6, lines 62-66. However, the dispersion in Kambe is simply a reaction intermediate, where the inorganic particle, polymer, and optional linker compound are in the process of being reacted together. For example, in the Kambe dispersion, the optional linker molecules can first modify/react with the inorganic particles, or can first bond to the polymer, or the linker can bond to the inorganic particle and polymer simultaneously. Kambe col. 6, lines 33-40. But notably, formation of the Kambe dispersion is consequent with reaction between the inorganic nanoparticles and linker or polymer. As Kambe specifies, "[c]onditions for the combined particle dispersion and polymer dispersion/solution should be suitable for the formation of bonds between the linker, the inorganic particles

and the polymer." Kambe col. 6, lines 53-56. Thus, the Kambe dispersion is merely a brief intermediate en route to formation of the polymer-inorganic particle composite.

If any significant population of inorganic particle reacted with linker exists in the Kambe dispersion, it is simultaneously being depleted/consumed by subsequent reaction with the polymer. Kambe does not teach or contemplate a dispersion of inorganic particles that are already reacted with the linker, and consequently, Kambe does not teach a dispersion having surface-modified, cationically stabilized, inorganic nanoparticles. And nowhere does the Kambe reference disclose nanoparticles modified with at least one compound of formula I (i.e., $[(S\text{-})_o\text{-}L\text{-}]_mM(R)_n(H)_p$), as presently claimed. Accordingly, Applicant respectfully requests reconsideration of the claims and withdrawal of the rejection.

1.2 Kambe does not disclose a dispersion of modified nanoparticles in addition to a separate crosslinker.

Independent claim 1 is drawn to an aqueous dispersion that includes surface-modified, cationically stabilized, inorganic nanoparticles in addition to at least one crosslinking agent. The surface modified inorganic nanoparticles are described in the preceding section and exemplary crosslinking agents are described in paragraphs [0127] to [0132]. The separate crosslinking agent contains functional groups that are reactive with complementary groups on the polymer/oligomer, on the surface-modified nanoparticles, in the amphiphile, or with themselves. Paragraph [0127]. Application of the claimed dispersion to a substrate, by spraying for example, is followed by thermal

curing and/or curing with actinic radiation. Paragraphs [0146] and [0151]. Thus, the separate crosslinking agent can react with the various dispersion components, including the inorganic nanoparticles already modified with a compound of formula I, in order to form the cured coating or film.

In contrast, the optional linker in the dispersion described in Kambe chemically bonds to the inorganic particle and also reacts with a terminal group of the polymer molecule. Kambe col. 5, lines 32-34 and 49-51. Therefore, in the Kambe dispersion, the linker is not connecting a surface modified inorganic nanoparticle and a polymer molecule; it is bonding directly to an unmodified inorganic particle and to a polymer. Alternatively, if the present rejection is presuming that the linker bonded to the inorganic nanoparticle is similar to the presently claimed surface-modified inorganic nanoparticle, then the Kambe reference fails to disclose a separate crosslinker within the dispersion.

In the Response to Arguments on page 4 of the Office Action from July 5, 2007, the linker compounds are alleged to be crosslinking agents. However, even if the linker compound in Kambe is viewed as a crosslinking agent, the reference still fails to disclose a dispersion that has surface-modified inorganic nanoparticles in addition to the crosslinking agent or linker compound. Specifically, the present claims separately recite surface-modified, cationically stabilized, inorganic nanoparticles (modified with at least one compound of the general formula I), in addition to at least one crosslinking agent.

The claimed crosslinking agent is further described in the specification in paragraphs [0127] to [0132]. As illustrated therein, a crosslinking agent contains reactive functional groups which are able to undergo reactions with themselves and/or with complementary reactive groups found on the polymer/oligomer, surface-modified

nanoparticles, or amphiphile. That is, the crosslinking agent contains groups that are reactive with the other components; the crosslinking agent is not already reacted with one or more of these other components. As such, the crosslinking agent is indeed "independent" of either the polymer or inorganic particle in the dispersion if the Examiner is implying that the claimed crosslinking agent is already reacted with at least one of the other components. For example, only as a separate entity can the crosslinking agent react with the other claimed features in the various combinations as described, this would not be possible if the crosslinking agent was already bonded to one of the other components. Moreover, a crosslinking agent as generally understood in the art is a distinct and independent compound. See for example, tris(alkoxycarbonylamino)triazines in paragraph [0129]; and melamine-formaldehyde resins (CYMEL® 327, hexamethoxymethyl type) in paragraphs [0175] and [0192].

Since the present claims include both a surface modified inorganic nanoparticle and a separate crosslinker, while the dispersion disclosed in Kambe contains only inorganic particles and a linker, the Kambe reference fails to include all the claimed features. Accordingly, Applicant respectfully requests reconsideration of the claims and withdrawal of the rejection.

2. REJECTION UNDER 35 U.S.C. § 103

Claim 2 is rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, 35 U.S.C. 103(a) as allegedly unpatentable over Kambe et al. This rejection is respectfully traversed.

To establish a *prima facie* case of obviousness, the combined prior art references must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Or, if the references are missing claimed features, there must be some apparent reason either in the references or the general knowledge in the art by which to modify the references to include the missing subject matter. See *Id.* and *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007). The apparent reason to combine or modify the references should be made explicit in order to facilitate review. *KSR Int'l Co. v. Teleflex Inc.* at 1740-41, 82 USPQ2d at 1396; and see *In re Kahn*, 441 F3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning to support the legal conclusion of obviousness."). In the present case, the Kambe reference fails to disclose all the presently claimed features and, in addition, no apparent reason is identified by which a skilled artisan would modify the Kambe teachings to include the missing subject matter.

2.1 Kambe does not disclose all the claimed features.

The Kambe reference fails to disclose all the features of independent claim 1 which is the base claim of dependent claim 2. Namely, the Kambe does not disclose the particular surface-modified nanoparticles in addition to a separate crosslinker. In contrast, claim 1 is drawn to a dispersion having a polymer/oligomer, inorganic nanoparticles with surface modifications by the compound of formula (I), an amphiphile/organic compound, and a separate crosslinking agent. As discussed in the

preceding section regarding traverse of the 35 USC §102 rejection, Kambe only teaches inorganic particles that can be chemically bonded to a monomer/polymer unit with or without a linker compound.

In fact, Kambe only teaches a dispersion in context of forming a composite product which is then molded, extruded, or coated. The (unmodified) inorganic particles, polymer, and optional linker are dispersed and/or combined in various orders to react the three components to form the composite. See Kambe dispersions at col. 18, line 64 et seq; composite formation at col. 21, line 21 et seq. Kambe is silent regarding a dispersion of inorganic nanoparticles whose surface is modified with a compound of formula I (i.e., $[(S\text{-})_o\text{-}L\text{-}]_mM(R)_n(H)_p$). Similarly, the dispersion used to form the composite does not include a separate crosslinking agent. The reference, therefore, is missing features of the present claims.

2.2 <u>There is no apparent reason based upon the Kambe reference to supply the missing subject matter.</u>

No apparent reason exists in the Kambe teachings by which a skilled artisan would be led to include the missing surface-modified inorganic nanoparticles and at least one crosslinking agent. Indeed, the Kambe reference teaches that the linker compound is optional and that the inorganic particles can be directly bonded to the polymer. Kambe col. 4, lines 58-62. Thus, the focus in the Kambe reference is bonding the inorganic particles to the polymer to form a composite, whether a linker compound is used or not. There is no reason for a skilled artisan to include surface-modified

inorganic nanoparticles and a separate crosslinking agent in the dispersion used to form the composite.

The Kambe reference also forms a dispersion only as an intermediate in generating the composite. The inorganic particle, optional linker compound, and polymer are dispersed and bonded together. Kambe col. 6, lines 28-39 and 48-59. After the bonding is complete, the composite (of reacted products) is processed further. Kambe col. 6, lines 59-61. For example, the composite can be molded, extruded, or cast to form various shapes of materials, or the composite can be coated from a solvent based slurry. Kambe col. 6, lines 62-67. Thus, the Kambe dispersion is reacted first and then the composite is further molded or coated. There is no reason for a skilled artisan to modify the surface of the nanoparticles using a compound of formula I and subsequently use the surface-modified nanoparticles in a dispersion, nor is there any reason for a skilled artisan to further include at least one crosslinking agent within the dispersion.

Only the present claims teach a dispersion that can be applied to a substrate and subsequently cured using thermal energy and/or actinic radiation. That is, the presently claimed dispersion can be reacted after coating, whereas the dispersion in Kambe is reacted to form the composite and then is processed by molding, extruding, or coating. Kambe col. 6, lines 62-67. For example, the separate crosslinking agent of the present claims is used to cure the applied dispersion to form a crosslinked film. See Examples 1 & 2, paragraphs [0170]-[0201]. The present dispersions are therefore useful in forming highly scratch-resistant, high-gloss, flexible, acid- and water-resistant, firmly

adhering, antistonechip clearcoats as part of multicoat color and/or effect paint systems. Paragraph [0142].

2.3 There is no apparent reason based upon the general knowledge in the art to supply the missing subject matter.

The rejection of claim 2 fails to provide an apparent reason based on the general knowledge in the art by which a skilled artisan would include a surface-modified nanoparticle and at least one crosslinking agent in the dispersion disclosed in Kambe. Consequently, there is no basis for a skilled artisan to modify the Kambe reference to include the missing subject matter. Applicants respectfully request reconsideration of the claims and withdrawal of the rejection.

3. CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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